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THE EFFECT OF ECONOMIC GROWTH ON LIFE EXPECTANCY IN UGANDA

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ABSTRACT

Life expectancy is an important indicator of population health, human development and socioeconomic progress. Although economic growth is generally expected to improve health and longevity through increased income, improved living conditions and greater capacity to invest in health and education, the extent of this relationship in Uganda remains insufficiently established. This study examined the short-run and long-run effects of economic growth on life expectancy in Uganda using annual time-series data for the period 1982–2024. The study employed time series econometric analysis - secondary data obtained from the World Bank World Development Indicators. Life expectancy at birth was the dependent variable while GDP per capita was the variable of interest for the study. Domestic general government health expenditure and primary school enrolment were included as control variables meant to evaluate their level of complementarity to economic growth in influencing life expectancy. An Autoregressive Distributed Lag (ARDL) bounds testing approach was used to examine cointegration and estimate both short-run and long-run relationships. The bounds test established a long-run relationship among the variables with an F-statistic of 18.994 exceeding the 1% upper critical bound of 6.976. The error correction coefficient was negative and statistically significant at -0.2221, indicating that approximately 22.2% of short-run deviations from long-run equilibrium are corrected annually. In the long run, GDP per capita had a positive and statistically significant effect on life expectancy ($\beta = 0.2553$, $p < 0.001$), while primary school enrolment had a small positive effect ($\beta = 0.00192$, $p = 0.027$). Domestic general government health expenditure had a negative and statistically significant coefficient ($\beta = -0.0864$, $p = 0.008$). The 2003 structural-break dummy associated with the scale-up of antiretroviral therapy was positive and statistically significant ($\beta = 0.01734$, $p = 0.004$). Granger causality tests further indicated bidirectional causality between GDP per capita and life expectancy. However, the Ramsey RESET test indicated model specification concerns and therefore the individual coefficient estimates should be interpreted cautiously. The study highlights the importance of sustained economic development, effective health expenditure and targeted public health interventions in improving longevity in Uganda.

KEYWORDS: *Economic Growth, Life Expectancy, GDP Per Capita, Health Expenditure, Education, ARDL, Uganda*

1. INTRODUCTION

Life expectancy at birth represents the average number of years a newborn is expected to live if prevailing age-specific mortality rates remain unchanged. It is widely used as an indicator of population health, human development and socioeconomic progress. Life expectancy reflects several interconnected factors including healthcare, nutrition, education, sanitation, living conditions and economic resources. The dissertation identifies economic growth as one of the important factors that may influence longevity because increased income can expand access to healthcare, nutrition, education and other conditions necessary for healthy living.

The relationship between income and life expectancy has been explained through several theoretical perspectives. The Human Capital Model views health as a form of capital in which individuals and governments invest resources to improve health and productivity. The Preston Curve proposes a positive but concave relationship between income and life expectancy, implying that income gains produce larger improvements in longevity at lower income levels while the gains diminish at higher income levels. The augmented Solow Growth Model further suggests a reciprocal relationship between health and economic growth because healthier populations can be more productive while economic growth provides resources for investment in health and education. The Capability Approach emphasizes that income alone may not translate into improved wellbeing unless appropriate social, institutional and environmental conditions are available.

Uganda has experienced considerable changes in life expectancy over the past several decades. The dissertation reports that life expectancy declined substantially during the HIV/AIDS crisis but subsequently increased as Uganda experienced economic growth and expanded health interventions including antiretroviral therapy. At the same time, the country continues to face challenges related to poverty, health financing, population growth and unequal access to health services. These developments make Uganda an important setting for examining whether improvements in longevity are associated with economic growth itself or with other socioeconomic and health-related factors.

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Previous evidence on Uganda has been limited. Tigatoola (2017), using simple regression for 1988–2015, reported no significant relationship between economic growth and life expectancy. The dissertation argues that such an approach does not adequately address non-stationarity, confounding factors or differences between short-run and long-run relationships. The present study therefore uses an ARDL framework to examine the relationship dynamically.

The study specifically sought to establish whether a long-run relationship exists between economic growth and life expectancy, examine short-run dynamics and speed of adjustment and determine the direction and magnitude of the effects of GDP per capita, health expenditure and primary school enrolment on life expectancy.

Research Objective

To establish whether a long-run relationship exists between economic growth and life expectancy in Uganda, examine short-run dynamics and speed of adjustment, and determine the direction and magnitude of the effects of GDP per capita, health expenditure and primary school enrolment on life expectancy.

2. THEORETICAL PERSPECTIVE

The relationship between economic growth and life expectancy is explained through several theoretical perspectives. The Human Capital Model views health as a form of capital in which individuals and governments invest resources to improve health and productivity. The Preston Curve proposes a positive but concave relationship between income and life expectancy, implying that income gains produce larger improvements in longevity at lower income levels while the gains diminish at higher income levels.

The augmented Solow Growth Model suggests a reciprocal relationship between health and economic growth because healthier populations can be more productive while economic growth provides resources for investment in health and education. The Capability Approach emphasizes that income alone may not translate into improved wellbeing unless appropriate social, institutional and environmental conditions are available.

3. LITERATURE REVIEW

3.1 Economic Growth and Life Expectancy

Economic growth may improve life expectancy through several channels. Higher income can increase household purchasing power, improve nutrition and housing and increase access to healthcare. At the national level, economic growth may expand the resources available for public services and infrastructure.

Evidence from Sub-Saharan Africa generally indicates a positive association between income and longevity. Abubakari et al. (2019), using data from 44 Sub-Saharan African countries, reported positive effects of GDP per capita, health expenditure and education on life expectancy. Keita (2013) also reported a positive relationship between GDP per capita and health outcomes using panel data from 45 Sub-Saharan African countries. However, evidence is not completely consistent. Kabir (2008) found GDP per capita, education and urbanisation to be statistically insignificant determinants of life expectancy in a sample of developing countries. In Uganda, Tigatoola (2017) also found no significant relationship between economic growth and life expectancy. These differences indicate the importance of country-specific analysis and appropriate time-series methods.

3.2 Health Expenditure and Life Expectancy

Health expenditure is another important determinant of population health. Increased health spending may improve healthcare infrastructure, preventive services, medical treatment and access to essential medicines. Evidence from OECD countries and African countries generally indicates a positive relationship between health expenditure and life expectancy. However, the effectiveness of expenditure may depend on how resources are allocated and used rather than on the amount spent alone.

In Uganda, public health expenditure remains relatively limited while households also face substantial out-of-pocket costs. The dissertation therefore included government health expenditure as a control variable to establish whether changes in public health investment were associated with changes in life expectancy.

3.3 Education and Life Expectancy

Education can affect longevity through improved health knowledge, health-seeking behaviour, nutrition, hygiene and preventive practices. The Human Capital Model proposes that education improves the efficiency with which individuals produce health.

Previous evidence cited in the dissertation generally supports a positive relationship between education and health outcomes. In Uganda, Makate (2016) found that maternal education was associated with reduced under-five mortality while Amwonya et al. (2022) linked

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women's education with improved family care, nutrition and vaccination. These findings provide a basis for including primary school enrolment as a control variable.

3.4 HIV/AIDS, ART and Life Expectancy

The HIV/AIDS epidemic significantly affected mortality and life expectancy in Uganda. The subsequent expansion of antiretroviral therapy contributed to reductions in mortality among people living with HIV. Evidence from rural and southwestern Uganda indicates substantial improvements in adult survival following the expansion of ART.

Because HIV prevalence was not suitable for direct inclusion in the ARDL model under the study's integration results, the research incorporated a 2003 structural-break dummy to capture a major change associated with ART scale-up. The dummy was intended to represent a structural change rather than serve as a direct measure of ART coverage.

4. METHODOLOGY

4.1 Research Design

The study employed a quantitative explanatory research design. It used secondary annual macroeconomic and demographic data to investigate relationships among economic growth, health expenditure, education and life expectancy in Uganda. Econometric analysis was conducted using Stata 14.

4.2 Data Sources

The study used annual data covering 1982–2024 obtained from the World Bank World Development Indicators. The dataset contained 43 annual observations before accounting for the loss of observations associated with the lag structure.

4.3 Variables

Life expectancy at birth was the dependent variable. GDP per capita measured economic growth and was the main explanatory variable. Domestic general government health expenditure and gross primary school enrolment were included as control variables. A 2003 structural-break dummy was included to capture the structural change associated with the ART scale-up.

The empirical relationship was specified as:

$$lnLIFE_t = \beta_0 + \beta_1 lnGDP_t + \beta_2 lnHEXP_t + \beta_3 lnEDUC_t + \beta_4 D2003_t + \varepsilon_t$$

The study also considered a nonlinear specification involving the squared logarithm of GDP per capita to reflect the concave relationship suggested by the Preston Curve.

4.4 Estimation Procedure

The ARDL bounds testing approach developed by Pesaran, Shin and Smith (2001) was used. The procedure involved testing the stationarity of variables using Augmented Dickey-Fuller and Phillips-Perron tests, selecting appropriate lag lengths using information criteria, testing for cointegration using the ARDL bounds test and estimating long-run and short-run relationships through the error correction model.

Diagnostic tests included tests for serial correlation, heteroskedasticity, normality, model specification and multicollinearity. CUSUM and CUSUMSQ tests were also used to assess parameter stability.

5. RESULTS

5.1 Descriptive Statistics

The study used 43 observations. Life expectancy had a mean of 54.81 years with a minimum of 43.31 years and a maximum of 68.49 years. GDP per capita had a mean of US$615.45 with values ranging from US$329.58 to US$986.09. Mean government health expenditure was 0.79% while mean primary school enrolment was 99.91%.

5.2 Correlation and Multicollinearity

GDP per capita was positively correlated with government health expenditure ($r = 0.5354$) and primary school enrolment ($r = 0.6293$). Health expenditure and primary school enrolment had a relatively high positive correlation ($r = 0.8361$). Despite these correlations, the VIF results indicated no serious multicollinearity, with a mean VIF of 2.97 and individual VIF values below 5.

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5.3 Cointegration

The ARDL bounds test established evidence of a long-run relationship among life expectancy, GDP per capita, health expenditure and primary school enrolment. The calculated F-statistic was 18.994, exceeding the reported 1% upper critical bound of 6.976. The reported t-statistic was -4.315, below the 5% upper critical value of -3.812. These results led the study to reject the null hypothesis of no long-run relationship.

5.4 Error Correction and Short-Run Dynamics

The error correction coefficient was -0.2221 and statistically significant ($t = -4.32$, $p < 0.001$). This indicates that approximately 22.2% of deviations from long-run equilibrium are corrected each year.

In the short run, the first and second lags of GDP per capita were negative and statistically significant. The first lag had a coefficient of -0.1167 ($p = 0.018$) while the second lag had a coefficient of -0.1337 ($p = 0.006$). The contemporaneous GDP change was not statistically significant ($p = 0.268$).

Primary school enrolment also showed a small negative effect at its first lag (-0.000312, $p = 0.023$) while its contemporaneous and second-lag effects were not statistically significant. The 2003 structural-break dummy was positive and statistically significant (0.01734, $p = 0.004$). The ECM model reported an R^2 of 0.7797.

5.5 Long-Run Effects

GDP per capita had a positive and statistically significant long-run coefficient of 0.2553 ($p < 0.001$). This indicates a positive association between economic growth and life expectancy over the long run.

Primary school enrolment also had a positive and statistically significant long-run coefficient of 0.00192 ($p = 0.027$).
In contrast, domestic general government health expenditure had a negative and statistically significant coefficient of -0.0864 ($p = 0.008$). The dissertation interprets this finding as potentially reflecting limitations in the efficiency, targeting or composition of health expenditure. However, because the study also reported model specification concerns, this coefficient should be interpreted cautiously rather than as evidence that health spending itself reduces longevity.

5.6 Granger Causality

The Granger causality analysis indicated bidirectional predictive causality between GDP per capita and life expectancy. GDP per capita Granger-caused life expectancy with $\chi^2 = 32.984$ and $p < 0.001$ while life expectancy Granger-caused GDP per capita with $\chi^2 = 14.134$ and $p = 0.003$.

These results indicate that past movements in GDP per capita contained information useful for predicting life expectancy while past movements in life expectancy also contained information useful for predicting GDP per capita.

6. DISCUSSION

The positive long-run relationship between GDP per capita and life expectancy is consistent with the Human Capital Model and the Preston Curve. The finding suggests that economic expansion may contribute to improved longevity through increased household resources, improved living conditions, nutrition and access to healthcare. It is also consistent with evidence reported by Keita (2013) and Abubakari et al. (2019) for Sub-Saharan Africa.

The short-run negative lagged effects of GDP per capita contrast with the positive long-run relationship. The dissertation interprets this difference as potentially reflecting transitional pressures associated with rapid economic change, including urban congestion, environmental pressure and delays in translating economic gains into health-related improvements. Because these explanations were not directly measured in the model, they should be regarded as possible interpretations rather than directly established mechanisms.

The positive long-run association between primary school enrolment and life expectancy is consistent with the view that education can improve health literacy and health-related behaviour. It also corresponds with previous evidence from Uganda and Africa linking education with improved health outcomes.

The negative coefficient for government health expenditure differs from several cross-country studies that reported positive relationships between health expenditure and life expectancy. The dissertation suggests that expenditure effectiveness, allocation and targeting may be important considerations. However, the finding should be treated cautiously because the study reported failure of the Ramsey RESET specification test.

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The significant 2003 structural dummy highlights the importance of major health interventions during the period of ART expansion. The result suggests that changes in mortality associated with the HIV/AIDS response cannot be fully explained by economic growth alone. This supports the broader argument that longevity is influenced by both economic and health-system factors.

The bidirectional Granger causality between GDP per capita and life expectancy is consistent with the augmented Solow perspective in which health can contribute to productivity while economic growth creates resources that support health improvement.

7. CONCLUSION

The study found evidence of a long-run relationship between economic growth and life expectancy in Uganda over the period 1982–2024. GDP per capita was positively associated with life expectancy in the long run while primary school enrolment also showed a positive relationship. Government health expenditure recorded a negative long-run coefficient, although this result requires cautious interpretation given the model specification limitation identified by the Ramsey RESET test.

The error correction model showed that approximately 22.2% of short-run disequilibrium was corrected annually. The short-run effects differed from the long-run effects, demonstrating the importance of distinguishing temporary economic dynamics from long-term relationships. The significant 2003 structural-break coefficient also indicates that major health interventions coinciding with the ART scale-up were associated with changes in the trajectory of life expectancy.

Overall, the findings suggest that improvements in longevity in Uganda are associated with a combination of economic growth, education and major health interventions rather than economic growth operating in isolation.

8. POLICY IMPLICATIONS

First, policies that support sustainable increases in GDP per capita may contribute to long-term improvements in population health. Economic policies should therefore be considered alongside health and social development policies.

Second, the negative coefficient on government health expenditure suggests the importance of examining the efficiency, allocation and targeting of health resources rather than focusing only on the volume of expenditure. However, further research is needed before drawing strong conclusions about the effect of health spending itself.

Third, investments in education should remain part of Uganda's long-term human development strategy because the study found a positive association between primary school enrolment and life expectancy.

Fourth, the significant structural effect associated with 2003 highlights the importance of targeted public health interventions. Sustained investment in HIV/AIDS treatment, vaccination, malaria control and other disease-specific interventions can complement the benefits associated with economic development.

Finally, the bidirectional relationship between economic growth and life expectancy suggests that health policy can also be viewed as part of human capital and economic development policy.

9. LIMITATIONS OF THE STUDY

The study was based on 43 annual observations from 1982 to 2024. Although ARDL is suitable for relatively small samples, the limited number of observations may affect the strength of statistical inference.

The Ramsey RESET test was statistically significant ($p = 0.0114$), indicating possible model specification problems. The dissertation identifies possible concerns relating to functional form and omitted variables. Consequently, the estimated individual coefficients should be interpreted as evidence of association within the specified model rather than definitive causal estimates.

The ADF and Phillips-Perron tests also produced different conclusions regarding the stationarity of life expectancy. In addition, HIV prevalence could not be incorporated as a continuous control variable because of its reported integration properties. The use of a 2003 structural dummy therefore provides only a simplified representation of a complex HIV/AIDS and ART transition.

Finally, the Granger causality results indicated bidirectional relationships between GDP and life expectancy. This means that a single-equation ARDL framework cannot fully resolve the issue of simultaneous feedback between economic growth and health.

10. RECOMMENDATIONS FOR FURTHER RESEARCH

Future studies should consider nonlinear time-series techniques such as Nonlinear ARDL or smooth transition models to investigate whether positive and negative changes in economic growth have different effects on life expectancy.

Future research could also apply Vector Error Correction Models or simultaneous-equation approaches to investigate the bidirectional relationship between economic growth and life expectancy more comprehensively.

Further studies should incorporate additional determinants of life expectancy where reliable data are available, including HIV prevalence, healthcare quality, sanitation, urbanisation, poverty and environmental conditions.

Country-specific research could also investigate the efficiency and composition of government health expenditure to explain why the present study obtained a negative long-run coefficient.

11. CONTRIBUTION OF THE STUDY

The study contributes to the literature by providing country-specific time-series evidence on the relationship between economic growth and life expectancy in Uganda. Unlike earlier Ugandan research based on simple regression, the study applies an ARDL framework capable of distinguishing long-run relationships from short-run dynamics.

The study also incorporates health expenditure, primary school enrolment and a structural-break dummy associated with the 2003 ART transition. Its findings therefore provide a broader empirical assessment of the economic and social factors associated with Uganda's long-term changes in life expectancy.

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